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(54) IMPROVEMENTS IN OR RELATING TO FLEXIBLE BUNDLING STRAPS

(71) We, G.M.T. S.A., a French company organised and existing under the laws of France, of Zone Industrielle Sud, Boulevard Pierre Lefauchaux, LE MANS, Sarthe, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention is concerned with flexible bundling straps.

The present invention provides a flexible bundling strap comprising an intermediate portion which has a plurality of teeth and an end connector portion which provides a passage for insertion and drawing therethrough of the opposite end portion of the strap, to form the strap into a loop, with said plurality of teeth facing inwardly of the loop, said passage being partially defined by a flexible tongue of the connector portion, the flexible tongue of the connector portion being provided with a plurality of teeth arranged to engage and maintain engagement of teeth of said intermediate portion therewith, when the intermediate portion is drawn therethrough, and is under tension, the flexible tongue being further provided with means for facilitating bending of the tongue portion to effect disengagement of the teeth from one another when desired.

Preferably the teeth of the intermediate portion each have an inclined leading face extending as a curved surface to the apex of the tooth and a rearward face extending to the bottom of a groove between that tooth and an adjacent tooth, each groove having in section a profile complementary to that of each tooth.

Preferably the teeth of said flexible tongue each have a profile which is complementary to the profile of the grooves between the teeth of the intermediate portion of the strap, said teeth being inclined in such a way that the rearward faces thereof tend to resist disengagement of the strap introduced into said passage.

[Price 33p]

Preferably said connector portion comprises two wings or arms connected by at least one cross-piece defining with the flexible tongue said passage for insertion of the intermediate portion of the strap. Preferably said passage is provided with convergent walls provided by the teeth of the tongue and by the at least one cross-piece.

Alternatively said connector portion is formed by a stiff loop which is thicker than the intermediate portion and comprises a first cross-piece connected by two lateral arms to a second cross-piece to which is hinged the flexible tongue. Preferably the loop is formed in one piece with the rest of the strap and has a thickened portion providing a recess greater than the width and thickness of the intermediate portion for receiving a portion of the intermediate portion when the strap is tightened around, for example, a bundle of wires.

Preferably said means is provided at a free end portion of the flexible tongue and comprises an extension for engagement by a tool for bending and thus releasing said tongue with respect to the teeth of the intermediate portion introduced into the passage. Alternatively the means comprises a rib or other grippable extension at the free end portion of the tongue and the tongue forms a shoulder located within the loop.

The tongue may be shaped to provide two flexure regions.

Preferably between the intermediate portion and the connector portion there is provided a projecting portion against which a finger of a user can be applied to resist slipping of the strap when it is being tightened.

There now follows a detailed description which is to be read with reference to the accompanying drawings of two straps according to the invention; it is to be clearly understood that these straps have been selected for description to illustrate the invention by way of example and not by way of limitation.

In the drawings:—

Figure 1 shows a first strap according to the invention;

Figure 2 and 3 show enlarged views of two portions of the strap shown in Figure 1;

Figure 4 is a sectional elevation view of another portion of the strap of Figure 1;

Figure 5 and 6 show two stages of assembling the strap shown in Figure 1;

Figure 7 is a sectional elevation view showing another strap according to the invention;

Figure 8 is a plan view taken along line VIII—VIII of Figure 7;

Figure 9 is a sectional elevation view, similar to Figure 7, but showing another characteristic.

A first portion of the first strap according to the invention is a thin tongue 1 of constant thickness designed to make easier insertion into a mouth 16 of passage 18 defined by an opposite end portion of the strap (hereinafter described) wherein a portion of the strap is secured.

The tongue 1 is formed inwardly with a portion 2 of a similar thickness but provided with a relief formed by teeth 2a of saw tooth form, each tooth having a slope 2d raising up the level of each edge 2c by a few tenths of a millimeter. The fall 2b of each tooth is perpendicular to the general plane of the strap when the latter is laid flat. This shape facilitates introduction of the portion 2 of the strap into the mouth 16 and passage 18 of the aforesaid opposite end portion of the strap whilst resisting movement of the portion 2 to remove it from the passage 18.

The portion 2 is integrally formed with a flat short portion 3 which is itself integrally formed with an intermediate portion 4 having on its "lower" side, a plurality of teeth 5 the number of which is dependent on the length of the portion 4. Each tooth 5 has a front slopping or leading face 5c which gradually increases up to a top face 5a and then decreases by a few tenths of millimeter down to the apex 5d. This arrangement is provided to present a substantially continuous surface in tangential contact with the elements to be enclosed to prevent their damage by penetration and rubbing.

Furthermore, the height 5g of each tooth is sufficient for allowing the same to lie down on the strap supporting said tooth when the same is applied with a high pressure on elements to be encircled.

The relief so determined by all the teeth 5 thus contributes, upon a pre-tightening step, to stop the strap from slipping from its initial position and prevents damage to the elements which are strapped together. The counter-slope of the rearward face 5e of each tooth is inclined to provide a maximum retaining angle. This counter-slope is planar and ends at the same theoretical level as the

lower face 3a of the portion 3. The bottom 5b of each groove 6 is complementary to the slope of the surface 5a and 5c of the tooth; the profile of each groove 6 is also complementary to that of each tooth 5.

The strap comprises a further portion 7 designed to provide the means whereby a user of the strap can hold the strap and prevent it slipping around whatever the strap is applied to while the strap is being tightened.

The portion 7 comprises a number of steps 8 each having a top face 8a and a vertical face 8b allowing a user to place his thumb to restrain the strap from slipping during tightening thereof.

The portion 8 is integrally connected by a short bridge portion 9 with an end connector portion 10 which comprises two wings 11 connected together by a shoulder 12 adjacent base portions 11a of the wings, from which shoulder 12 rises a tongue 22 which is neither fastened nor connected to the wings 11. The tongue 22 can be moved forward or backward with respect to two cross-pieces 13 and 14 integrally formed with the wings 11 and defining, with the tongue 22, the passage 18 which is used for insertion of the strap. The tongue 22 is provided with teeth 20, 20a, 20b, 20c, in a number according to the retaining strain which is desired. The teeth 20 are formed in the same way as the teeth 5, so that each tooth 20 is located in the groove 6 determined by the space between two teeth 5.

The cross-piece 14 has a curved surface 14a for facilitating insertion of the tongue portion 1 of the strap into the mouth 16 and for preventing the strap, when under strain, from being bent at a sharp angle and from bearing on a sharp edge. The second cross-piece 13 has a recess 13a for preventing the thin tongue portion 1 from engaging the cross-piece 13 and thereby being obstructed upon insertion of the tongue portion 1.

A passage 17 is defined between the cross-pieces 13, 14 to facilitate insertion of the strip 4 with only one tooth 5 being engaged in the passage 18. The cross-piece 13 has a curved surface 13b opposite to the tip of the tongue 22 to ease sliding of the strip 4 out of the exit 19 of the passage 18. The mouth 16 is progressively narrower into the passage 18 which is provided with convergent walls defined by the line of teeth 20, 20a, 20b, 20c and by the cross-pieces 13 and 14. The purpose of this arrangement is to facilitate engagement of the upper tooth 20c in a corresponding groove 6 of the strap. When the first tooth 20c is engaged, the resulting traction on the free end portion of the tongue 22 pulls the same in a direction which would close the exit 19 of the passage 18. The other teeth 5 then engage in cor-

responding grooves 21, 21a and 21b, and the teeth 20 of tongue 22 engage in the grooves 6 of the portion 4. Locking is thus entirely realized at this point.

5 The tongue 22 has at its upper end a portion 22a limited by a bevelled edge 23 facing the exit 19. This bevelled edge 23 makes it possible, with an appropriate tool, to push back the tongue 22 from its engaging position towards a position causing a widening of the exit 19 of the passage 18. Thus the disengagement of the portion 4 and release of the teeth 5 and 20 is possible. The pressure exerted by the tool on the bevelled edge 23 being no longer applied, the tongue 22 can return to its initial position in which the teeth 5 and 20 are in engagement.

A flexible strap, such as described in the above disclosure, is made of thermoplastics material and can be used to group and bundle any number of tubular objects or elements, such as electronic cables.

A second strap according to the invention is shown in Figures 7 and 8. Parts of this second strap are similar to those of the above described strap and are indicated by the same reference numerals. The connector portion is formed by a stiff loop 51 which is wider than the rest of the strap and has a thickness substantially double that of the rest of the strap at the level of a rear cross-piece 52 extended by two lateral arms 53 connected by a cross-piece 54. The bottom face of the portion 4a of the strap extends downwardly (viewing Figures 7 and 8) substantially straight below the cross-piece 52 to provide an increasing thickness to the arms 53 and to give to the cross-piece 54 a thickness to the arms 53 and to give to the cross-piece 54 a thickness which is substantially greater than the thickness of the cross-piece 52.

A recess 55 slightly wider and deeper than the portion 4 is defined between the arms 53 and by the cross-piece 54 so that the portion 4 can lie within the confines thereof. The arms 53 are separated from the sides of the tongue 22, which is connected to the portion 4a, by a flexible base portion 56. The tongue 22 extends substantially at an angle of 45° with respect to the general plane of the strap and is of such a length that said tongue intercepts the general line of the passage 18. The angle of the tongue 22 is preferably such as to allow the sides of the teeth 20 to slope generally towards the front cross-piece 54. The teeth 20 protrude from a flat face 57 of the tongue which ends at a shoulder 58 substantially in the same plane as a curved surface 59 between the end of the recess 55 and the side portion of the cross-piece 54 defining the passage 18. Reference number 60 designates grippable rib formed at the top of the tongue 22 to effect disengagement of the teeth from one another when desired.

The direction of the inclined slopes of the teeth 20 promotes easy passage for the portion 2 of the strap. The strap is then tightened and set under strain, thus causing a tooth 5 of the portion 4 to penetrate into the upper groove 21 of the tongue 22 which is urged about the base 56 in the direction of arrow f_2 when a pull is applied to the strap to ensure tightening thereof around wires, pipes or the like to be bundled together. After tightening, the pull constraint causes the tooth 5, which is engaged in the upper groove 21, to move the tongue 22 into a direction opposite to that of arrow f_2 . This causes a successive engagement of the teeth 20 and 5 respectively into the corresponding grooves 6 and 21, which has for its effect to reinforce locking of the intermediate portion extending through the passage 18. It is to be noticed that said intermediate portion takes the form of the curved surface 59 and is not consequently submitted to any significant bending effect liable to damage the strap.

To facilitate further bending of the tongue, the side portion 61 can have a hollow portion 62 shown in chain-dot lines in Figure 7, said hollow portion being designed to reduce the tongue section on this side of the base 56 in order to determine a second bending region.

Figure 7 shows also a variant of the tongue 22 wherein the same presents the hollow portion 62 and a shoulder 58a located more on this side of the base 56 than the shoulder 58. Said arrangement provides for making a more accurate difference between the two bending thresholds of the tongue 22.

WHAT WE CLAIM IS:—

1. A flexible bundling strap comprising an intermediate portion which has a plurality of teeth and an end connector portion which provides a passage for insertion and drawing therethrough of the opposite end portion of the strap to form the strap into a loop, with said plurality of teeth facing inwardly of the loop said passage being partially defined by a flexible tongue of the connector portion, the flexible tongue of the connector portion being provided with a plurality of teeth arranged to engage and maintain engagement of teeth of said intermediate portion therewith when the intermediate portion is drawn therethrough, and is under tension, the flexible tongue being further provided with means for facilitating bending of the tongue portion to effect disengagement of the teeth from one another when desired.

2. A strap according to claim 1 wherein the teeth of the intermediate portion each have an inclined leading face extending as a curved surface to the apex of the tooth, and a rearward face extending to the bottom of a groove between that tooth and an adjacent

tooth, each groove having in section a profile complementary to that of each tooth.

3. A strap according to either one of claims 1 and 2 wherein the teeth of said flexible tongue each have a profile which is complementary to the profile of the grooves between the teeth of the intermediate portion of the strap, said teeth being inclined in such a way that the rearward faces thereof tend to resist disengagement of the strap introduced into said passage.

4. A strap according to any one of the preceding claims wherein said connector portion comprises two wings or arms connected by at least one cross-piece defining with the flexible tongue said passage for insertion of the intermediate portion of the strap.

5. A strap according to claim 4 wherein said passage is provided with convergent walls provided by the teeth of the tongue and by the at least one cross-piece.

6. A strap according to any one of the preceding claims wherein said means is provided at a free end portion of the flexible tongue and comprises an extension for engagement by a tool for binding and thus releasing said tongue with respect to the teeth of the intermediate portion introduced into the passage.

7. A strap according to any one of claims 1 to 3 wherein said connector portion is formed by a stiff loop which is thicker than the intermediate portion and comprises a first cross-piece connected by two lateral

arms to a second cross-piece to which is hinged the flexible tongue.

8. A strap according to claim 7 wherein the loop is formed in one piece with the rest of the strap and has a thickened portion of a width and depth greater than the width and thickness of the intermediate portion for receiving portions of the intermediate portion when the strap is tightened around, for example, a bundle of wires.

9. A strap according to any one of claims 1 to 5, wherein the means comprises a rib or other grippable extension at the free end portion of the tongue and the tongue forms a shoulder located within the loop.

10. A strap according to any one of the preceding claims wherein the tongue is shaped to provide two flexure regions.

11. A strap according to any one of the preceding claims wherein between the intermediate portion and the connector portion there is provided a projecting portion against which a finger of a user can be applied to resist slipping of the strap when it is being tightened.

12. A strap according to claim 1, substantially as hereinbefore described and illustrated with reference to the accompanying drawings.

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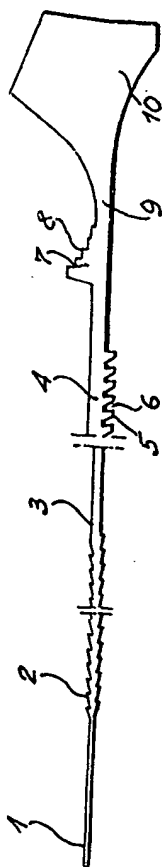


Fig. 1.

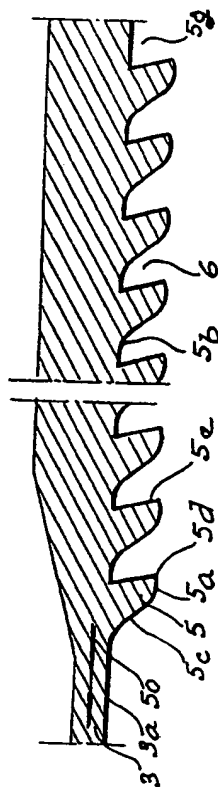


Fig. 2.

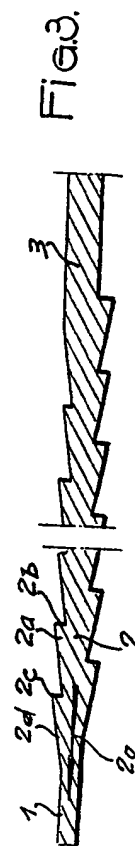
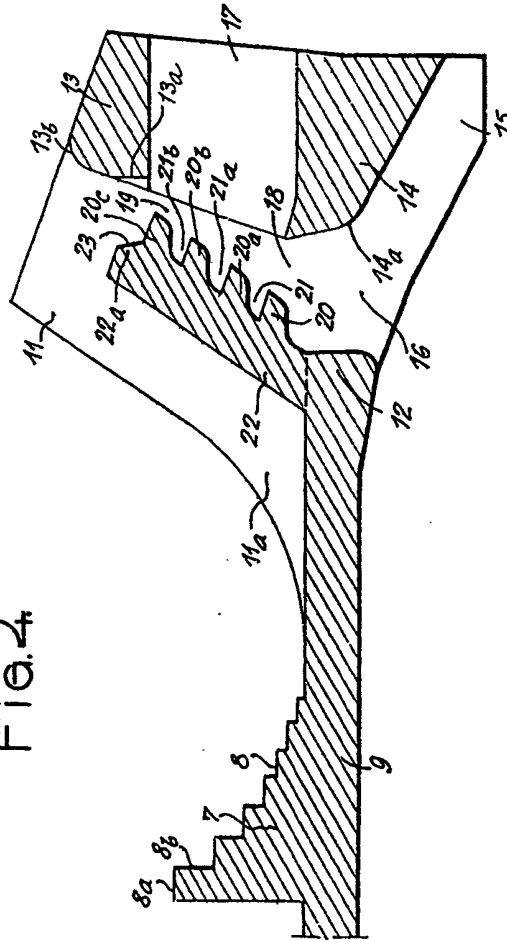


Fig. 3.

FIG. 4



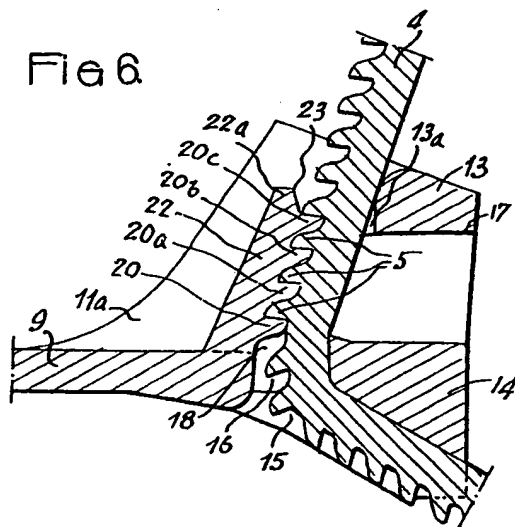
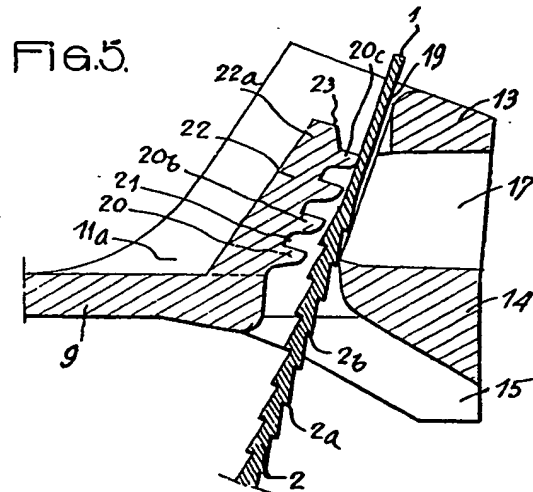
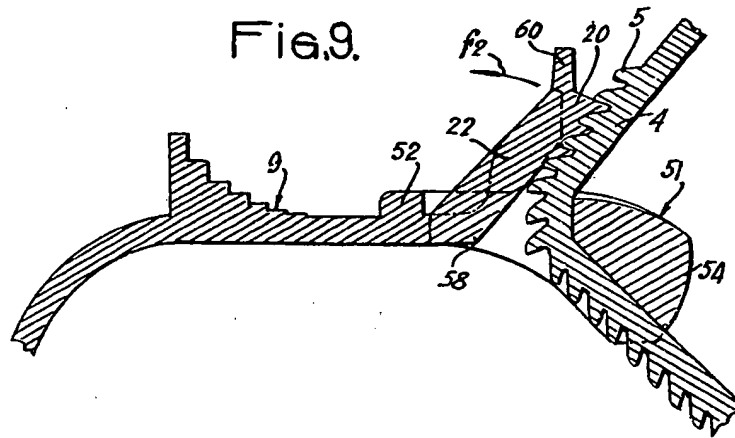


Fig.9.



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